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IMPORTANT DATES:

- SuperFrog XXIX
Triathlon
22 September
- Miramar Air Show
12-14 October
- Society for
Neuroscience
3-7 November
- Veteran's Day
11 November
- Thanksgiving
24 November

Naval Health Research Center

Quarterly Update

FALL 2007



Understanding Human Performance Under Extreme Stress: The SERE Study

We've all experienced it. A car swerves into your lane in traffic, and seconds later your heart is pounding. Or, while waiting to give a lecture to a group of your peers, you notice your palms are sweating and you feel a little bit faint. These physiologic responses reflect your "fight-or-flight response," a primitive mechanism designed to prepare your brain and body to respond effectively to a threatening situation.

The Stress Physiology Research Core, or SPRC (pronounced "SPIRK"), of the

Warfighter Performance Department is engaged in an ONR- and Navy Core



Capabilities-funded program of research to more fully understand the physiologic mechanisms underlying "fight or flight," and to gain more insight into individual differences in stress resilience in extreme military contexts.

In other words, we aim to identify what makes one Sailor or Marine continue to perform well in the face of extreme stress while another does not, and, likewise, why some develop posttraumatic stress disorder while others remain unaffected.

Our laboratory. Welcome to SERE (Survival, Evasion, Resistance, and Escape) training. Sailors and Marines who are considered at higher risk of capture by enemy forces (e.g., SEALs and aircrew) attend this grueling training program, where

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Recent Activities

Dr. Jerry Larson (Head, Behavioral Science and Epidemiology Program) and Linda Trent traveled to Naval Aviation Technical Training Command, Pensacola FL, and Naval Construction Training Center, Gulfport, MS, to meet with Navy leadership and launch the new DoD alcohol safety program at both sites.

The program utilizes personal, disposable alcohol breathalyzers (called Alcohol Safety Devices, or ASDs) to help raise awareness and reduce heavy drinking and alcohol-related incidents. The researchers established procedures for distributing ASDs to incoming students and training them in the proper use

of the ASDs, as well as procedures for issuing refills, and for distributing ASD evaluation sheets to graduating students. The team also met with the Special Assistant for Safety at NETC, Pensacola. The trip was very successful; nearly 1,500 Navy students have already been initiated into

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The Millennium Cohort Study



The Millennium Cohort Study is the largest prospective health study ever undertaken by the Department of Defense. The project will define how military occupational exposures, including deployments, impact long-term health. All military services and the Department of Veterans Affairs have co-investigators on this project, that is led by the Naval Health Research Center, Department 164 (the DoD Center for Deployment Health Research), and funded through the

DoD Military Operational Medicine Research Program.

Like the Framingham Heart Study and other large cohorts, this epidemiologic design is the most powerful in determining causative links between exposures and health outcomes. Launched in 2001, and expected to continue through at least 2022, results of the Millennium Cohort Study are expected to resonate in public health for years to come.

Participants are asked to complete one questionnaire, by mail or online, every three years. The third questionnaire effort was launched in May 2007. Over the next ten months, a series of postcards, emails, and questionnaire packets will be sent to thousands of service members. These include more than 108,000 participants who enrolled in 2001 or

2004, as well as a new random sample of invited participants. The full Cohort is expected to include more than 147,000 members.

The team is honored to have received an endorsement letter from the Chairman of the Joint Chiefs of Staff, General Peter Pace. Other approvals include: DMDC Reference Number 00-0019, RCS Number DD-HA(AR) 2106, OMB Approval Number 0720-0029, ASD/HA/TMA Protocol Number CDO-06-206, and Primary IRB Protocol Number NHRC.2000.0007.

The Millennium Cohort was designed in the late 1990s. Its launch at the start of the millennium made it perfectly positioned to describe the effects of the current Global War on Terrorism (GWOT) on long-term health. Specific analyses related to GWOT deployment focus on: new-onset PTSD, depression,

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Spotlight

The second annual Walter Wilkins Award for the best paper recognized for excellence in biomedical research was presented on 26 July 2007 to CDR Kevin Russell, Anthony Hawksworth, CDR Margaret Ryan, Jennifer Strickler, Marina Irvine, and Christian Hansen for their publication, Vaccine-preventable adenoviral respiratory illness in US military recruits, 1999-2004. *Vaccine*, 2006 Apr 5; 24 (15): 2835-42.

The purpose of this award is to honor the first Scientific Director of NPRU/NHRC, Dr. Walter L. Wilkins. Dr. Wilkins is remembered for his skills as a leader and mentor. He had high goals and aspirations, helping

many young scientists develop their full potential at NHRC.

The top 3 finalists were: Mike Galarneau, Paula Konoske, Ted Melcer, Ross Vickers, Jay Walker, James Zouris, The Navy-Marine Corps Combat Trauma Registry. *Military Medicine*, 2006 Aug; 171 (8): 691-7.

Besa Smith, Tyler Smith, Margaret Ryan, A Comparison of the Postdeployment Hospitalization Experience of U.S. Military Personnel Following Service in the 1991 Gulf War, Southwest Asia After the Gulf War, and Bosnia. *Journal of Occupational and Environmental Hygiene*, 2006 Dec; 3: 660-70

Kevin Russell, Michael Broderick, Peter Kammerer, Miguel Osuna, Margaret Ryan, Transmission Dynamics and Prospective Environmental Sampling of Adenovirus in a Military Recruit Setting. *Journal of Infectious Diseases*, 2006; 194: 877-85



Recent Activities (Cont.)

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the pilot DoD program.

The Department of Respiratory

Disease Research has been following the emergence of adenovirus serotype-14 in our recruit training populations. This serotype has been associated with severe illnesses at both Lackland AFB and MCRD-Parris Island. The Department is closely monitoring this pathogen, and participating in research which will help us understand if the current adenovirus vaccination restoration program with serotypes 4 and 7 will provide any cross-protection for this emerging serotype.

Medical Modeling, Simulation, and Mission Support hosted an Emergency Resuscitative Surgical System USS BATAAN Post-Deployment SME Conference 7-8 August at the Naval Base Point Loma, San Diego. The meeting was to evaluate the results of the ERSS aboard the USS BATAAN, document lessons learned, and review clinical requirements, patient stream, medical tasks, and associated supplies and equipment.

Dr. Stephanie Booth-Kewley and Ms. Robyn Highfill-McRoy began data collection for the Warfighter Status Survey funded by Headquarters Marine Corps. The study was

launched at Camp Pendleton CA on 20 Jun 07 and is being conducted to provide HQMC with an understanding of how combat experiences affect the physical and mental health of Marines deployed to OIF & OEF.

Ms. Gen Padilla, Mrs. Amanda Markham, Mr. Jared Reis, and LT Marc Taylor visited Helicopter Squadron-Medium 41 (HSM41) 28 JUN 07. During the visit, the group flew the Helicopter Flight Simulator, visited with key members of the squadron, and toured the facility in order to augment their research efforts with a better understanding of fleet operations.

Recent Publications & Presentations

Larson GE, Kewley S, Villasenor A. Helping a Buddy Survive the War: Evidence-Based Principles for Sustaining Life and Sanity. NHRC Technical Report 07-23.

Smith TC, Smith B, Jacobson IG, Corbeil TE, Ryan MAK, for the Millennium Cohort Study Team. Reliability of standard health assessment instruments in a large, population-based cohort study. *Annals of Epidemiology*. 2007 Jul;17(7):525-32.

Smith TC, Jacobson IG, Smith B, Hooper TI, Ryan MAK, for the Millennium Cohort Study Team. The occupational role of women in military service: validation of occupation and prevalence of exposures in the Millennium Cohort Study. *International Journal of Environmental Health Research*. 2007 Aug;17(4):271-84.

Stander VA, Hilton SM, Doran AP, Werbel AD, Thomsen CJ. Department of the Navy Suicide Incident Report (DONSIR): Summary of 1999-2004 Findings. NHRC Technical Report 07-05.

Strickler JK, Hawksworth AW, Myers C, Irvine M, Ryan MAK, Russell KL. Influenza vaccine effectiveness among US military basic trainees, 2005-06 season. *Emerging Infectious Diseases* 2007 APR, vol I, no 4.

Taylor MK, Sausen KP, Mujica-Parodi LR, Potterat EG, Yanagi MA, Kim H. Neurophysiologic methods to measure stress during survival, evasion, resistance, and escape training. *Aviation, Space & Environmental Medicine* 2007; 78(5, Suppl.):B224-30.

Taylor MK, Larson GE, Miller AE, Mills LJ, Potterat EG, Reis JP, Padilla GA, Hoffman RJ. Predictors of Success in Basic Underwater Demolition/SEAL (BUD/S) Training - Part II: A Mixed Quantitative and Qualitative Study. NHRC Technical Report 07-10.

Vickers Jr., RR. Physical Readiness Training: A Meta-Analysis. NHRC Technical Report 07-20.

Woodruff SI, Dye JL, Morhle CR, Galarneau MR, Wade AL. Use of Recombinant Factor VIIa for Control of Combat-Related Hemorrhage: Findings From the U.S. Navy Marine Corps Combat Trauma Registry. NHRC Technical Report 07-13.

Millennium Cohort (Cont.)

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alcohol misuse, smoking, disordered eating, respiratory health, and long-term outcomes related to mild traumatic brain injury.

The Millennium Cohort Study team has 11 recent publications in the scientific literature, and has received 9 research awards. Recent citations include:

Smith B, Leard CA, Smith TC, Reed RJ, Ryan MAK, for the Millennium Cohort Study Team. Anthrax vaccination in the Millennium Cohort: validation and measures of health. *American Journal*

of Preventive Medicine. 2007 April; 32 (4): 347-353.

Chretien JP, Chu LK, Smith TC, Smith B, Ryan MAK, for the Millennium Cohort Study Team. Demographic and occupational predictors of early response to a mailed invitation to enroll in a longitudinal health study. *BMC Medical Research Methodology*. 2007; 7:6.

Riddle JR, Smith TC, Smith B, Corbeil TE, Engel CC, Wells TS, Hoge CW, Adkins J, Zamorski M, Blazer D; for the Millennium Cohort Study Team. Millennium Cohort: the 2001-2003

baseline prevalence of mental disorders in the U.S. military. *Journal of Clinical Epidemiology*. 2007 Feb; 60 (2):192-201.

Ryan MA, Smith TC, Smith B, Amoroso P, Boyko EJ, Gray GC, Gackstetter GD, Riddle JR, Wells TS, Gumbs G, Corbeil TE, Hooper TI. Millennium Cohort: enrollment begins a 21-year contribution to understanding the impact of military service. *Journal of Clinical Epidemiology*. 2007 Feb; 60(2): 181-91.

For more information, see:

www.millenniumcohort.org

The SERE Study (Cont.)



(Continued from page 1)

participants are taught to survive and evade enemy captors, relying only on their recently acquired skills of navigation, food and water procurement, and evasion from enemy forces. Once "captured," trainees are taken to a simulated prisoner of war camp, where they must survive and resist during one of the harshest and most realistic forms of training in today's military.

Our measures. Prior to SERE training, functional magnetic resonance imaging (fMRI) was used to take high-resolution pictures of

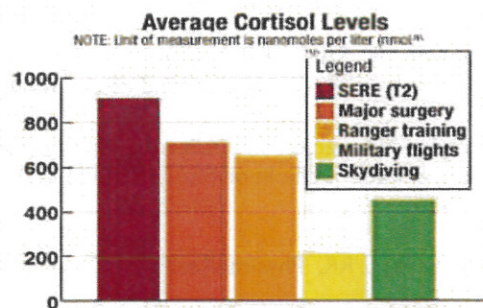
subjects' brains to examine how particular parts of the brain (called the amygdala and the hippocampus) respond to mild laboratory stress. In addition, we established a daily profile of the stress hormone cortisol. Finally, examining psychophysiologic responses such as galvanic skin reactivity, electrical responses to acoustic startle, and heart rate variability. Ultimately, aiming to see if these variables may serve as markers" of resilience (versus susceptibility) to the subsequent stress of survival training.

Our preliminary findings.

Variables shown to be predictive of human performance and stress reactivity during SERE training include heart rate during sleep and while awake, heart rate variability, and adaptive coping skills. Adaptive coping skills are associated with a healthier daily cortisol profile

during free living — a known buffer against morbidity and early mortality. We also found that the stress hormone cortisol increases up to 17 times its resting value during survival training.

Future plans. To present a clearer picture of the factors that influence performance during survival training. Knowledge gained from this study may ultimately help Sailors and Marines in an unfortunate survival and evasion scenario, or as a prisoner of war.



(www.training.sfhq.com/survival_training.htm)

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Command Corner



CAPT Kerry Thompson
Commanding Officer

Military leaders and medical providers are faced with a new generation of injured Sailors and Marines who refuse to discontinue their active lifestyles and are requesting to return to active duty in record numbers. In response to this, the U.S. Army has established two rehabilitation and research centers at Walter Reed Army Medical Center and the Center for the Intrepid to rehabilitate wounded service members and promote active research into the science of prosthetics, rehabilitation and

life skills reacquisition, primarily within the amputee population. In October 2007, the Naval Medical Center San Diego will open the Comprehensive Combat Casualty Care Center (C5) to provide a west coast location to treat severely wounded service members. NHRC has been identified to provide basic and applied science research related to the advancement of rehabilitation of combat injured service members throughout DoD, to provide clinical research support to C5 and act as a partner for multi-center collaborations with established Army centers and external colleagues.

NHRC is well positioned to succeed as we move forward through our established expertise in the study of neurocognitive function, applied exercise and stress physiology and combat trauma related epidemiology research. However, as we adapt to our new requirements, we will need to embrace change as well. To meet the needs of combat injured veterans and the military medical community, the Warfighter Performance department will

expand its mission to provide basic and applied science and clinically relevant research of human performance that advances science and technology innovations for the evaluation, rehabilitation and return to duty of severely wounded warriors. The most notable changes will be taking place in the Building 74 laboratory as we enhance our capabilities in motion and biomechanical analysis, evaluation of posture and balance and expand our capabilities to study human motion and cognitive function within virtual environments.

As we enhance our capabilities we will continue to be driven by our mission to develop and deliver operational biomedical research solutions that enhance the health, safety, readiness and performance of our military forces. The goals of this new requirement are consistent with this mandate and the strength and quality of the people within this Command and our ability to produce high quality research that is directly applicable to the warfighter will ensure our success.